

# Victor Klymko, Ph.D.

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## PHYSICIST / ELECTRICAL ENGINEER

*Integrating thorough physics insight into efficient engineering solutions.* Modeling and testing of innovations in smart lighting and sustainable energy components. Delivering results and managing collaborations for multi-partner European projects. *Engineering and technical expertise includes*

Solutions:	Piezoelectric transformers; half-bridge converters
Design:	Vibration and acoustic piezoelectric energy harvesters
Methodologies:	Experimental, Analytical, Finite Element Analysis (FEA), Method of Moments
Hardware:	Network / impedance analyzers, generators, multimeters, o-scopes
Tools:	Matlab, COMSOL, PZFlex, Mathematica, SPICE, Mathcad, Maple, HFSS
Programming:	FORTRAN, C++, HTML
OS's:	Windows ('98, XP, 7), MacOS X, Linux (Ubuntu), Unix (Solaris)

## EXPERIENCE HIGHLIGHTS

Eindhoven University of Technology ([TU/e](#)), Netherlands

### Postdoctoral Researcher

01/2012 – Present

[Energy efficient and intelligent lighting systems](#) (partners: *Osram, Philips, NXP Semiconductors*,...)

Analytical and numerical modeling of piezoelectric transformers (PT) for powering LED lighting systems. Using signal processing to increase the power delivered by PT. Integration of PT into a switched capacitor converter to realize a smart LED dimming solution.

- Developed analytical model for a multilayer PT including PCB mounting losses.
- Preserved the waveform and spectrum of a square pulse signal while maintaining high efficiency.
- Successfully tested the theory on a self-built half-bridge converter loaded with PT.

[SMARt systems Co-design](#) (partners: *Philips, ON Semiconductor, ST Microelectronics*,...)

Design, analytical and numerical modeling of vibration energy harvesters. FEA modeling of ultrasonic transducers and the surrounding media. Calculation, measurement of the ultrasonic energy harvesting efficiency.

- Designed and modeled an ultrasonic energy harvesting system for use in MRI machines.
- Tested a transducer array to focus the ultrasonic energy on the harvester.
- Introduced a phased array to set the position of the sound pressure peak at the harvester's location.
- Contributed to the project web site development

Taught the “Sustainable power sources for smart buildings” workshop.

University of Mississippi ([OleMiss](#)), MS, USA

### Visiting Assistant Professor

07/2010 – 12/2011

Lectured general physics and physics for science and engineering 200-level courses. Supervised graduate teaching assistants and graders. Advised a graduate student on a research project. Wrote 2 research proposals.

### Visiting Instructor

07/2009 – 06/2010

Taught physics lectures and laboratories for up to 70 pre-medical or engineering students.

Department of Physics and Astronomy, University of Mississippi, USA

### Graduate Research Assistant

08/2004 – 05/2009

Studied Lamb waves in multidomain ferroelectric plates. Developed a FORTRAN FEA code to calculate displacement components and surface charge induced by an ultrasonic wave in the periodically poled LiNbO<sub>3</sub> wafer. Calculated analytically and numerically the dispersion curves and piezoelectric coupling for multidomain ZX-cut LiNbO<sub>3</sub>, confirmed the calculations with experimental data. Designed and tested a new efficient ultrasonic delay line. Obtained two \$2500 grants from the UM Graduate School to fund the research.

*Over, please...*

Department of Electrical Engineering, University of Mississippi, USA

**Graduate Research Assistant**

**08/2002 – 07/2004**

Derived Electric Dyadic Green's function for hard surface power combiner with alternating metallic and dielectric strips. Calculated electromagnetic fields inside hard surface waveguides due to a current probe, a current dipole, and the closed and unclosed current rings using Method of Moments implemented in FORTRAN and Matlab codes. Prepared regular progress reports.

## EDUCATION

**PhD, Physics**, Solid State Physics, 2009

University of Mississippi, University, MS, USA

**MS, Electrical Engineering**, Electromagnetics, 2004

University of Mississippi, University, MS, USA

**MS, Radio Physics and Electronics**, Theoretical Radiophysics, 1996

Kharkiv National University, Kharkiv, Ukraine

## SELECTED JOURNAL PUBLICATIONS

**V. Klymko**, M.A.M. Hendrix, J.L. Duarte, and E. Lomonova, "**Efficient waveform preservation of discrete spectrum signals with multilayered piezoelectric transformer,**" *accepted*.

V. Ostrovskii, A. B. Nadochiy, **V. A. Klymko**, "**Velocity dispersion of plate acoustic waves in a multidomain phononic superlattice,**" Phys. Rev. B, **82**(1), 014302 (2010).

V. Ostrovskii, **V. A. Klymko**, A. B. Nadochiy, "**Plate wave stop bands in a periodically poled lithium niobate,**" JASA-EL, **125**(4), EL129 (2009).

**V. A. Klymko**, A. B. Nadochiy and I. V. Ostrovskii, "**Theoretical and experimental study of plate acoustic waves in ZX-cut lithium niobate,**" IEEE Trans. UFFC, **55**(12), 2726 (2008).

**V. A. Klymko**, A. B. Yakovlev, I. A. Eshrah, A. A. Kishk and A. W. Glisson, "**Dyadic Green's function of an ideal hard surface circular waveguide with application to excitation and scattering problems,**" Radio Science, **40**, RS3014 (2004).

## SELECTED CONFERENCE PRESENTATIONS

**V. Klymko**, M. Roes, J. van Duivenbode, and E. Lomonova, "**Phased transducer array for ultrasonic energy harvesting inside an MRI machine,**" Proc. Joint IEEE UFFC-IUS Symposia (2013).

**V. A. Klymko**, I. V. Ostrovskii, D. Sedorook, "**Aperiodic multidomain ferroelectric transducers,**" Fundamental Physics of Ferroelectrics Symp. (2010).

**V. A. Klymko**, I. V. Ostrovskii, "**Phononic band gaps in periodically corrugated lithium niobate plate,**" 156-th meeting Acoust. Soc. Am. (2008).

**V. A. Klymko**, A. B. Yakovlev, A. A. Kishk, A. W. Glisson, "**Scattering by closed and unclosed metallic rings in a circular waveguide,**" ACES, 94-101 (2006).

**V. A. Klymko**, A. B. Yakovlev, I. A. Eshrah, A. A. Kishk, A. W. Glisson, "**Scattering by open metal obstacles in a circular waveguide: dyadic Green's function approach,**" IEEE-AP Int. Symp., 2, 2127 (2004).